meager data, but, at least for this period, indicated a maximum rain squall frequency for the northeast trade-wind zone between 20° and 15°, and beyond 5° S. a distinct increase in frequency toward the higher latitudes. It is to be noted that the observations in the latter group were made during the Southern Hemisphere winter.

The normal trade-wind curve of temperature, while extraordinarily steady, nevertheless is made up of a multitude of tiny changes; and corresponding to these the trace for relative humidity seesaws constantly through a range of largely 2 to 5 per cent (occasionally reaching 8 to 10), these oscillations being superposed upon the very small diurnal swing.

The curves for temperature and relative humidity in the rain squalls are unmistakably different from these normal trade-wind curves, and they strongly resemble those made over a heated land surface. They seem to show clearly that isolated bodies of cold air exist in the otherwise uniformly turbulent trade-wind stream, the instability which they help to produce being altogether more marked at the surface than the normal instability which produces the trade-wind cumuli.

Two general types of temperature change occur with the rain squalls:

1. A fall lasting 2 to 4 hours, usually irregularly. It is sometimes interrupted by a slight rise, after which the approach to the minimum is more rapid than before. Recovery of normal temperature may be either slow or rapid.

2. A type requiring at the most three-quarters of an hour for the completion of the changes during the passage of the ship through the body of cold air, sometimes scarcely 20 minutes.

There was one very special case (June 29, in latitude about 23° N.) differing from the above types. First occurred a slight cooling incident to a strong northerly squall with light to moderately heavy rain, and then came a sharp rise of temperature to above normal upon the veering of the wind into the ESE. The author suggests that this rise was due to the thrusting northward of warm air from lower latitudes in some manner connected with the passage of the cold air. Adequate discussion of this case was impossible, however; observations on wind direction were taken only at 4-hour intervals.

With regard to occurrence of the rain squalls in the southeast trades, the *Deutschland* registrations show clearly that the cold-air masses reached to 6° S. They have been observed with southeast wind on the South American coast northeast of Pernambuco.

The author regards these cold-air bodies as remnants of larger air masses thrust forward from high latitudes to and in part within the trade-wind boundaries, their breaking up giving opportunity for the rain squalls. He points out that this is, in a sense, nothing new, for it is well known that in winter, polar-air streams now and then reach almost to the Equator. The registrations discussed are, however, of special interest because they are the first automatic records from the Atlantic showing cold-air thrusts into the trade-wind zones.—*B. M. V.*

AN UNDERDEVELOPED TORNADO

By G. SHIPMAN

[Weather Bureau Office, Fort Smith, Ark., May 24, 1926]

An underdeveloped tornado closely followed by a straight blow occurred at Fort Smith, Ark., during the late afternoon of April 23, 1926. It developed at the front of an advancing HIGH on the wind-shift line accompanied by a sharp drop in temperature. The sky was clear until 4:30 p. m. when it changed to partly cloudy, becoming cloudy at 5:30 p. m. A few alto-stratus clouds from the south were observed until 4:30 p. m., changing then to lower clouds with a dense bank to the north. At 5:30 the clouds became denser, with a small turbulent mass of mammato-cumulus moving from the south. The lower clouds moved from south to north, while the higher ones, when observed, moved from west to east along the path of the storm. Lightning, starting at 5:30 p. m., was vivid during the entire storm, the flashes, mostly perpendicular, passing from higher clouds through scud to the earth. The tornado cloud appeared at Fort Smith at 6:15 p. m., earlier to the west, and later to the east. It was observed by several persons, as a dense bank of greenish clouds with a narrow rope-like pendant. The pendant cloud rose and fell, seldom touched the earth, moved slowly, taking about three minutes to pass Fort Smith, dissolved to a mass of scud occasionally and reformed again at intervals of some miles. Light precipitation and light hail accompanied the storm. Moderate southerly winds prevailed during the day increasing after 6:00 p. m., attaining an extreme velocity of 61 miles at 6:26 p. m. and a maximum velocity for five minutes of 49 miles from the northwest at the same time. The wind shifted often during the storm and remained northwest to west afterwards. The pressure curve showed weak tornado features with a short, sharp drop before the storm and a rise of 0.30 inch in three hours following. Two persons in ordinary buildings in the path of the storm described the passage of the cloud over them as violently shaking the buildings without causing serious damage. The damage resulted from a straight blow that followed the storm by about 10 minutes. A five-month infant was killed at Branch, Ark., and about $10,000 damage was done at Fort Smith, with one person slightly injured. The storm's path was very narrow and extended from Salisaw, Okla., to Branch, Ark., about 52 miles. The débris and damage in the path showed straight blow effects as did instrumental records and direct observations. Had this storm occurred at night without observation of the tornado cloud probably no tornado would have been reported. Only persons near the tornado cloud heard any attendant noises.

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ARCTIC ICE IN 1925

[Reprinted from *Nature*, London, April 17, 1926]

The Danish Meteorological Institute has published its annual report on the state of the ice in the Arctic seas.

As usual, the data are most numerous from the Barents Sea, Spitsbergen, the west coasts of Greenland and Alaska, but in 1925 a good deal of information was available from the east coast of Greenland. From the Beaufort Sea and the coast of Siberia practically no data came to hand. The most notable feature of the year was the unusually small amount of ice observed in practically all the Arctic seas that were visited. During the summer, the Barents Sea was free from ice and the Kara Sea was remarkably open. Spitsbergen waters were very clear, and during August there was open water round practically the whole of the group. Franz Josef Land, as usual, was more or less inaccessible but there was open water on the north of Novaya Zemlya in August. On the east coast of Greenland the ice belt was narrow, and there appears to have been less drift from the north than usual. Bering Strait was open in June, but the north coast of Alaska not until late in July. Commander C. I. H. Sperrschneider, the editor of the report, comments on the facts that for several years, particularly in 1925, little old ice was found in the east Greenland or east Spitsbergen currents, and that most of the ice was of one winter's formation.

AURORA OF APRIL 14, 1926

Several reports of a brilliant aurora observed on the above date have come to the editor. The observers were located in Oregon, Wyoming, Nebraska, central Illinois, the Northeastern States and as far south as Fort Myers, Florida.—*A. J. H.*

METEOROLOGICAL SUMMARY FOR BRAZIL, MARCH, 1926

Condensed from translation by W. W. Reed of the *Summario da circulacão atmospherica no Sul e Centro do paiz*, in the Monthly Bulletin of the Meteorological Office, Rio de Janeiro]

The circulation in the lower atmospheric layers was much more intense in March than in February. The southern part of the continent was invaded by six anticyclones, and the continental depression and those of high latitudes were especially active. The anomaly noted in February continued in March—the systems of high pressure still moved in the direction of the meridians and weakened as they advanced. The semipermanent anticylcone of the Atlantic continued its influence over the continent. The weather was very much unsettled and abundant rains fell in the central part of the country.

On the 1st, southern Brazil was dominated by a HIGH and the northern and central regions of Argentina by a LOW, while another HIGH lay over the southern part of the continent. This last system moved northeastward, bringing fresh southeast winds in extreme southern Brazil and the adjacent part of Argentina on the 2d. The first invading HIGH appeared in the western part of Argentina on the 6th, remained more or less stationary until the following day, and then after moving in an abnormal course toward the east it finally turned northeastward and merged on the 9th with the anticyclone previously mentioned. The second anticyclone invaded Argentina on the 12th and moved rapidly northeastward. Depressions were very active on the 10th and 11th. On the 16th a third HIGH was built up over the southern part of the continent, and on the following day merged with the second anticyclone, the center of the resulting formation remaining over Argentina. The fourth anticyclone appeared in southren Argentina on the 18th, and, though weakened, moved east-northeastward.

On the 22d the fifth HIGH lay over southwestern Argentina; on account of the activity of the continental depression it lost intensity, but moved east-northeastward, and on the 25th remained as a small center of high pressure in southern Brazil, after which it again moved northeastward. On the 29th central Argentina felt the influence of the sixth anticyclone, which also moved northeastward. Depressions were rather active on the 27th and 28th.

METEOROLOGICAL SUMMARY FOR SOUTHERN SOUTH AMERICA, MARCH, 1926

By SEÑOR J. B. NAVARRETE

[El Salto Observatory, Santiago, Chile]

(Translated and slightly condensed by B. M. V.)

In this month Chilean rainfall increased considerably, and temperatures in general were lower in the central zone.

Up to the 6th there were no important departures from normal, the center of high pressure oscillating between Chiloe and Cabo Raper.

On the 7th a pressure decline began in the central zone on account of the approach of an important depression from the west, which by the 9th began to affect the continent, causing violent winds and rain in the southern zone, the center of the depression being located near Juan Fernandez with an observed minimum pressure of 752 mm.; on the 10th it was opposite the island of Huafo with pressure 744 mm., and rain extended to Aconcagua Province in central Chile. During the 11th the depression moved southward, pressure falling to 735 mm. at Punta Arenas, with bad weather. There was an interval of calm on the 12th and 13th, but on the 14th and 15th a new depression caused rains as far north as Valdivia, where 22 mm. were recorded.

From the 16th to the 23d an anticyclone dominated southern Chile, with general fine weather.

Another depression brought rains and high winds to southern Chile between Concepcion and Magallanes on the 25th to 28th, causing a general rise of the rivers. The heaviest precipitation of the month was registered at Valdivia on the 27th, 103 mm. in 24 hours. After an interevning period of higher pressure, rains occurred again over southern Chile on the 30th and 31st, the maximum precipitation of 56 mm. occurring at Valdivia.

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[C. FITZHUGH TALMAN, Meteorologist, in Charge of Library]

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